



## Effect of Chewing Tobacco on Hematological Parameters in Bikaner City Population

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### Abstract

**Background:** An increase in the consumption of tobacco has been noticed among high school students, college students, and sportspersons. This study attempts to find out whether 'chewing tobacco' causes any adverse effects on the certain hematological parameters.

**Material & Methods:** A cross sectional study has been conducted on the population of Bikaner city (Rajasthan) aged between eighteen years to fifty five years in the Department of Physiology, S.P. Medical College, Bikaner on hundred subjects i.e. fifty chewing tobacco users (study group) and another fifty chewing tobacco non-users who should not be active or passive smokers (control group). The chewing tobacco non-users & users was twenty five subjects each in group I (18-35 yrs) and group II (36-55yrs).

**Results:** The present study shows that chewing tobacco users have significantly higher Hb level, RBC count and TLC. The results of differential count shows that they even have significantly higher percentage of neutrophil in their blood. Moreover, lymphocyte and monocyte percentage in their blood are significantly lower. Platelets also significantly decreases in chewing tobacco users. The difference of mean value of Hb, RBC, TLC, Neutrophils, Lymphocytes, Monocytes and Platelets in chewing tobacco non-users & users is statistically highly significant in both group I and group II but the difference of mean value of Eosinophils and Basophils is statistically non significant in both group I and group II.

**Conclusion:** The present study suggests that in case of individuals using chewing tobacco, the assessment of hematological parameters or screening of anaemia should be dealt with caution. This is because altered hematological profile due to tobacco use by the subject may lead to misleading interpretations.

**Keywords:** Smokeless tobacco (SLT), Hematological parameters, Inflammation, Nicotine.

### Introduction

Tobacco is the dried and processed leaves of the plant *Nicotiana tobacum* that is widely cultivated and commercially grown in many countries of the world<sup>1</sup>. Chewing is the most common form of SLT use in India<sup>2,3</sup>. 'Khaini', tobacco with slaked

lime, is one of the widely used SLT in India<sup>4</sup>. In India, tobacco is taken in several other forms also, for example, Pan (betel quid), dried leaves (Patti), paste (Qiwam, Zarda), tobacco with lime (Khaini/Mawa)<sup>5</sup>. Its use is common in various parts of the world, including India and central

Asia. An increase in the consumption of tobacco has been noticed among high school students, college students, and sportspersons<sup>6-8</sup>. Despite the known health consequences of tobacco, “chewing” is not viewed by users as particularly dangerous and is considered less of a “social evil” than smoking by much of the public<sup>9,10</sup>. Previous reports have described long-term harmful effects of nicotine on various body parameters, little is known about the acute effect of tobacco smoking on cardiopulmonary parameters<sup>11</sup>. The harmful substances present in the tobacco smoke may lead to oxidative damage to the lungs, especially by causing accumulation of neutrophil in the lungs<sup>12,13</sup>. The effect of smoking on leukocyte count reflects inflammatory activity, exposures to oxidants or vulnerability of the host towards inflammatory conditions<sup>14</sup>. It has been known that to deal with the inflammatory response elicited by smoke of tobacco, protein degrading enzymes are released by the neutrophils which is more damaging for the normal cells in the vicinity<sup>15</sup>.

In view of the various pharmacological actions of nicotine and additives and the wide use in many regions and countries, chronic consumption of SLT may affect the status of hematological parameters and further delineate the effects of tobacco use to health. However, there are limited studies on the effect of consumption of chewing tobacco on haematological parameters in both man and animals. This study attempts to find out whether ‘chewing tobacco’ causes any adverse effects on certain hematological parameters.

### Material & Methods

A cross sectional study has been conducted on the population of Bikaner city (Rajasthan) aged between eighteen years to fifty five years in the Department of Physiology, S.P. Medical College, Bikaner on hundred subjects i.e. fifty chewing tobacco users (study group) and another fifty chewing tobacco non-users who should not be active or passive smokers (control group). In the study the data was compared between study and control groups.

Each group (study & control) was further subdivided on the basis of age in two sub-groups i.e. group I (18-35 years) and group II (36-55years) comprising twenty five subjects each.

### Selection Criteria for Study Group

1. Age should be between eighteen to fifty five years.
2. Exclusive smokeless tobacco users for at least last five years.
3. Body mass index should be within normal range
4. The subject was selected randomly in Bikaner City.

### Selection Criteria for Control Group

1. Same age group as study group.
2. Same Socioeconomic Status
3. Subjects who had never taken any type of tobacco in any form.
4. Body mass index should be within normal range.

### Exclusion Criteria

1. Smokers (Active as well as Passive).
2. Presence of any self reported acute illness, lung diseases, heart diseases, malignancy, chronic liver or kidney failure, diabetes mellitus, obesity, history of heavy alcohol consumption were excluded from the study.

### Statistical Analysis

The data were expressed as mean±SD. Statistical analysis were performed according to an intention to treat strategy. Quantitative data were presented as mean±SD and the student’s unpaired ‘t’ test was used to compare the differences. All p values were 2 tailed, p value<0.05 was considered significant. Analysis was performed by using SPSS version 6.0 computer software.

### Results

In this study the chewing tobacco non-users & users was twenty five subjects each in group I (18-35 yrs) and group II (36-55yrs) (table 1).

In our study showed the difference of mean value of Hb in chewing tobacco non-users & users (13.57±0.331 & 15.10±0.474) was statistically

highly significant ( $p < 0.0001^{***}$ ) in group I and the difference of mean value of Hb. ( $13.64 \pm 0.344$  &  $14.84 \pm 0.477$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group II (Table 2 & 3).

In our study showed the difference of mean value of RBC in chewing tobacco non-users & users ( $4.81 \pm 0.271$  &  $5.66 \pm 0.628$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group I and difference of mean value of RBC ( $4.86 \pm 0.282$  &  $5.31 \pm 0.62$ ) was statistically highly significant ( $p = 0.0019^{**}$ ) in group II (Table 2 & 3).

In our study showed the difference of mean value of TLC in chewing tobacco non-users & users ( $5.49 \pm 0.512$  &  $6.414 \pm 0.564$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group I and difference of mean value of TLC ( $5.37 \pm 0.513$  &  $6.55 \pm 0.547$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group II (Table 2 & 3).

In our study showed the difference of mean value of Neutrophil in chewing tobacco non-users & users ( $58.23 \pm 1.691$  &  $65.91 \pm 3.426$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group I and difference of mean value of Neutrophil ( $57.85 \pm 1.738$  &  $67.24 \pm 4.192$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group II (Table 2 & 3).

In our study showed the difference of mean value of Eosinophil in chewing tobacco non-users & users ( $1.80 \pm 0.559$  &  $1.816 \pm 0.580$ ) was statistically non-significant ( $p = 0.9606$  NS) in group I and difference of mean value of Eosinophil ( $1.94 \pm 0.62$  &  $1.98 \pm 0.978$ ) was

statistically non-significant ( $p = 0.8858$  NS) in group II (Table 2 & 3).

In our study showed the difference of mean value of Basophil in chewing tobacco non-users & users ( $0.41 \pm 0.311$  &  $0.39 \pm 0.294$ ) was statistically non-significant ( $p = 0.7808$  NS) in group I and difference of mean value of Basophil ( $0.42 \pm 0.29$  &  $0.52 \pm 0.498$ ) was statistically non-significant ( $p = 0.4315$  NS) in group II (Table 2 & 3).

In our study showed the difference of mean value of Lymphocyte in chewing tobacco non-users & users ( $36.32 \pm 1.367$  &  $29.70 \pm 3.086$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group I and difference of mean value of Lymphocyte ( $36.71 \pm 1.343$  &  $27.96 \pm 3.997$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group II (Table 2 & 3).

In our study showed the difference of mean value of Monocyte in chewing tobacco non-users & users ( $3.224 \pm 0.688$  &  $2.18 \pm 0.927$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group I and the difference of mean value of Monocyte ( $3.06 \pm 0.552$  &  $2.296 \pm 0.861$ ) was statistically highly significant ( $p = 0.0004^{***}$ ) in group II (Table 2 & 3).

In our study showed the difference of mean value of Platelets in chewing tobacco non-users & users ( $198.7 \pm 12.25$  &  $150.0 \pm 9.641$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group I and the difference of mean value of Platelets ( $196.1 \pm 12.03$  &  $150.8 \pm 9.554$ ) was statistically highly significant ( $p < 0.0001^{***}$ ) in group II (Table 2 & 3).

**Table 1:** Age based distribution of subjects (Chewing tobacco non-users and users)

Age group	Number of Chewing tobacco non-users	Number of Chewing tobacco users
Group I (18-35 years)	25	25
Group II (36-55 years)	25	25
Total	50	50

**Table 2:** Shows the Hematological parameters (mean  $\pm$  SD) in Chewing tobacco non-users and users in Group I (18-35 years)

S. No.	Hematological parameters	Chewing tobacco non-users (Mean $\pm$ S.D)	Chewing tobacco users (Mean $\pm$ S.D)	t Value	P Value
1	Hb(g/dl)	13.57 $\pm$ 0.3311	15.10 $\pm$ 0.4748	13.23	<0.0001***
2	RBC( $10^6/\mu$ L)	4.810 $\pm$ 0.2719	5.667 $\pm$ 0.6281	6.265	<0.0001***
3	TLC( $10^3/\text{mm}^3$ )	5.491 $\pm$ 0.5128	6.414 $\pm$ 0.5645	6.051	<0.0001***
4	Neutrophil (%)	58.23 $\pm$ 1.691	65.91 $\pm$ 3.426	10.05	<0.0001***
5	Eosinophil (%)	1.808 $\pm$ 0.5590	1.816 $\pm$ 0.580	0.04966	0.9606 NS
6	Basophil (%)	0.4160 $\pm$ 0.3118	0.3920 $\pm$ 0.2943	0.2799	0.7808 NS
7	Lymphocyte (%)	36.32 $\pm$ 1.367	29.70 $\pm$ 3.086	9.808	<0.0001***
8	Monocyte (%)	3.224 $\pm$ 0.6882	2.182 $\pm$ 0.9217	4.528	<0.0001***
9	Platelets ( $10^3/\text{mm}^3$ )	198.7 $\pm$ 12.25	150.0 $\pm$ 9.641	15.64	<0.0001***

**Table 3:** Shows the Hematological parameters (mean  $\pm$  SD) in Chewing tobacco non-users and users in Group II (36-55 years)

S. No.	Hematological parameters	Chewing tobacco non-users (Mean $\pm$ S.D)	Chewing tobacco users (Mean $\pm$ S.D)	t value	p Value
1	Hb(g/dl)	13.64 $\pm$ 0.3441	14.84 $\pm$ 0.4770	10.17	<0.0001***
2	RBC( $10^6/\mu$ L)	4.866 $\pm$ 0.2820	5.318 $\pm$ 0.6252	3.295	0.0019**
3	TLC( $10^3/\text{mm}^3$ )	5.373 $\pm$ 0.5131	6.557 $\pm$ 0.5479	8.128	<0.0001***
4	Neutrophil (%)	57.85 $\pm$ 1.738	67.24 $\pm$ 4.192	10.35	<0.0001***
5	Eosinophil (%)	1.948 $\pm$ 0.6292	1.982 $\pm$ 0.9786	0.1444	0.8858 NS
6	Basophil (%)	0.4280 $\pm$ 0.2965	0.520 $\pm$ 0.4983	0.7933	0.4315 NS
7	Lymphocyte (%)	36.71 $\pm$ 1.343	27.96 $\pm$ 3.997	10.38	<0.0001***
8	Monocyte(%)	3.068 $\pm$ 0.5521	2.296 $\pm$ 0.8615	3.773	0.0004***
9	Platelets ( $10^3/\text{mm}^3$ )	196.1 $\pm$ 12.03	150.8 $\pm$ 9.554	14.75	<0.0001***

## Discussion

The present study was conducted on the population of Bikaner city (Rajasthan) aged between eighteen years to fifty five years in the, fifty chewing tobacco users (study group) and another fifty chewing tobacco non-users (control group) who was not active or passive smokers. Each group (study & control) was further subdivided on the basis of age in two sub-groups i.e. group I (18-35 years) and group II (36-55 years) comprising twenty five subjects each. All included subjects were selected randomly.

The present study shows that chewing tobacco users have significantly higher Hb level, RBC count and TLC. The results of differential count shows that they even have significantly higher percentage of neutrophil in their blood. Moreover, lymphocyte and monocyte percentage in their

blood are significantly lower. Platelets also significantly decreases in chewing tobacco users. The difference of mean value of Hb, RBC, TLC, Neutrophils, Lymphocytes, Monocytes and Platelets in chewing tobacco non-users & users is statistically highly significant in both group I and group II but the difference of mean value of Eosinophils and Basophils is statistically non significant in both group I and group II.

Roan Mukherjee et al<sup>16</sup> found significant elevation (< 0.001) in total erythrocyte count, total leukocyte count, packed cell volume, hemoglobin level and neutrophil percentage. Significant reduction in the percentage of monocyte (< 0.05) and highly significant reduction in percentage of lymphocyte (< 0.001). Majority of the variation of these parameters between smokers and gutkha consumers were not significant (> 0.05). The

observed increased leukocyte count reflected that inflammatory responses had already started in the sample studied. Animal model studies have even found increase in PCV in gutkha treated mice. Earlier studies have also shown that Hb level may increase in gutkha users<sup>17</sup>. The increased total erythrocyte count of gutkha users seems to reflect that consuming gutkha may also stimulate erythropoiesis. An earlier study on mice treated with gutka observed insignificant rise in total erythrocyte count<sup>18</sup>. According to some authors, insufficient pulmonary function in gutkha consumers may impart a necessity of stimulating erythropoiesis for fulfilling the oxygen demands of the body<sup>18</sup>.

Nicotine present in tobacco may influence suprarenal glands causing it to secrete more catecholamine which may affect leukocytosis. It may be speculated that damages to tissues and inflammation<sup>18</sup> might have also operated behind an increase in total leukocyte count in gutkha users of the present study. The increased neutrophil percentage found in gutkha consumers of the present study may be associated with ongoing inflammation of tissues. Neutrophils are known to produce cytotoxic substances which adversely affects lung functions<sup>19-21</sup>. In the present study the decrease in lymphocytes observed among chewing tobacco users. Systemic stress potentiates the activity of sympathetic nervous system. This raises the cortisol secretion which has been found to be associated with a decrease in blood lymphocyte percentage<sup>22,23</sup>. Nicotine is also known to be stimulatory to the sympathetic nervous system<sup>24</sup>. Thus it may be speculated that smoking or using other tobacco products may result in similar lowering of lymphocyte percentage. An earlier study had concluded that lymphocytes, especially cytotoxic T cells or CD8+ T cells may get lowered in smokers<sup>25</sup>. Variations in these T lymphocytes may make the smokers vulnerable to develop neoplastic growths and infections<sup>26</sup>.

The present findings on percentage of neutrophil and lymphocyte of gutkha consumers corresponded with an earlier study on animal model, which similar to the present study documented increased percentage of neutrophil and decreased percentage of lymphocytes<sup>18</sup>. Like smoking, the inflammatory effects smokeless tobacco on lungs are well explored.

This present study also found that chewing tobacco users had lower levels of monocytes in blood than control group. Mild adverse effect on lungs may be the result of such variations of monocytes<sup>27</sup>. P. Jaganmohan et al<sup>17</sup> observed that haematological parameters in smokeless tobacco chewing auto drivers including hemoglobin content and leukocyte counts were higher in gutkha consumers than in controls, whereas monocytes and basophils counts were lower. B. Purushottama Dass et al<sup>28</sup> observed that hematological parameters including hemoglobin content, white blood cell and leukocyte counts were higher in gutkha consumers than in controls, whereas monocytes and basophils counts were lower. Roan Mukherjee et al<sup>16</sup> suggested that the negative effect of gutkha on blood hematology is no less adverse than smoking.

### Conclusion

The present study shows that chewing tobacco has adverse consequences in hematological parameters viz. increase in Hb level, RBC count, TLC, Neutrophils percentage and decrease in the percentage of monocytes & lymphocytes and decreased platelets. The present study suggests that in case of individuals using chewing tobacco, the assessment of hematological parameters or screening of anaemia should be dealt with caution. This is because altered hematological profile due to tobacco use by the subject may lead to misleading interpretations.

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